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Illumination measurements under film plastic covers for watercress beds

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Rough preliminary measurements of illumination under polythene covers in 1970-71 season indicated a light loss of some 25-30% due to the polythene cover. These measurements were made by spot readings of a photo-electric cell and it was hoped that more precise results could be obtained by using illuminometers recording continuously on a Kent multi-channel recorder.

The sampling interval was 5 seconds and the use of four channels out of twelve to record total solar radiation and illumination outside with illumination under two covers gave one reading of each sensor per minute with a 15-second delay between successive sensor readings. In view of this time lag, comparisons have been made using 5-minute average values for each sensor.

It was not practicable to leave the equipment unattended so a series of four runs were made on different dates under differing weather conditions.

1. January 3rd 1973 data for the period 1000-1400 GMT. Weather overcast with moderate visibility becoming foggy by mid-day.

Outside illumination values ranged from 3.73 to 9.44 kLx and relationships were found as follows:-

	Comparison elements	Correlation	Regression slope	Regression intercept
a)	Radiation and outside illumination	0.989	1.24	0.37
b)	Illumination outside and under polythene cover with fan ventilation	0.987	0.83	-0.53
c)	Illumination outside and under polythene, unventilated but with ultra-violet inhibitor	0.985	0.75	-0.28

The mean percentage decrease in illumination under the two covers was 27% for ventilated polythene and 31% for unventilated with standard deviations of 4.0 and 1.7 respectively. The mean difference between the ventilated and unventilated polythene covers was 4.5% with a standard deviation of 3.5. This advantage due to ventilation (and possibly also to different transmission properties of polythene with and without ultra-violet inhibitor) is significant at the 0.1% level.

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2. January 12th 1973 data for the period 1230-1330 GMT. Weather cloudy with moderate visibility.

Outside illumination ranged from 5.20 to 7.60 kLx.

	Comparison	Correlation	Slope	Intercept
a)	Radiation, Illumination	0.997	1.18	0.58
b)	Illumination outside and under polythene with ultra-violet inhibitor	0.996	0.69	-0.13
c)	Illumination outside and under EVA	0.994	0.74	-0.11

The mean percentage decrease in illumination under polythene was 33% (SD 0.8) and under EVA 28% (SD 0.9). The mean difference between polythene and EVA was 7% (SD 2.0), this advantage of EVA over polythene being significant at the 0.1% level.

3. January 16th 1973 A bright sunny day with outside illumination ranging from 18.96 to 37.70 kLx. It was not possible to make valid comparisons between the illumination values under different covers because of the shading of the sensors by the framework of the covers - the positioning of the sensors introduced a variation which was not possible to control in this experiment.

The radiation against outside illumination comparison gave:

Correlation	Slope	Intercept
0.993	1.28	-0.13

4. February 28th 1973 Data available for the period 1000-1500 GMT. Weather cloudy at first but sunny intervals later, good visibility.

Range of outside illumination 4.55 to 26.94 kLx.

	Comparison	Correlation	Slope	Intercept
a)	Radiation, Illumination	0.998	1.20	1.02
b)	Illumination outside and under polythene	0.997	0.71	-0.19
c)	Illumination outside and under EVA	0.999	0.74	-0.32

The mean percentage decrease for polythene was 31% (SD 2.2) and for EVA was 29% (SD 1.9). The difference between polythene and EVA was 2.5% (SD 3.5), the advantage of EVA over polythene being significant at the 0.1% level.

Conclusions

The earlier data on loss in illumination due to film plastic covers is confirmed at about 30% in cloudy weather.

Although there is evidence of approximately 5% advantage due to ventilation in the case of polythene and of a similar advantage of EVA over polythene, the sample is probably too small and too limited in weather type for one to be confident that these are real advantages.

Any comments or suggestions on this paper should be referred to the author.

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